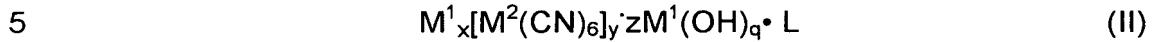


WHAT IS CLAIMED IS:

1. A hydroxide containing double metal cyanide (DMC) catalyst of the formulae (I) or (II),



wherein

M^1 represents a metal selected from the group consisting of Zn^{+2} , Fe^{+2} , Ni^{+2} , Mn^{+2} , Co^{+2} , Sn^{+2} , Pb^{+2} , Fe^{+3} , Mo^{+4} , Mo^{+6} , Al^{+3} , V^{+4} , V^{+5} , Sr^{+2} , W^{+4} , W^{+6} , Cu^{+2} and Cr^{+3} ,

10 M^2 represents a metal selected from the group consisting of Fe^{+2} , Fe^{+3} , Co^{+2} , Co^{+3} , Cr^{+2} , Cr^{+3} , Mn^{+2} , Mn^{+3} , Ir^{+3} , Ni^{+2} , Rh^{+3} , Ru^{+2} , V^{+4} and V^{+5} ,

L represents an organic ligand,

x , y , and q are chosen to maintain electroneutrality, and

15 wherein the catalyst is crystalline.

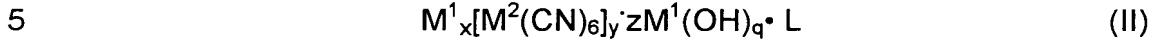
2. The hydroxide containing double metal cyanide (DMC) catalyst according to Claim 1, wherein the organic ligand, L , is selected from the group consisting of alcohols, polyols, polyether polyols, aldehydes, 20 ketones, ethers, esters, amides, ureas, nitriles, sulfides and mixtures thereof.

3. The hydroxide containing double metal cyanide (DMC) catalyst according to Claim 1, wherein the organic ligand, L , is selected from the 25 group consisting of ethanol, isopropanol, n-butanol, isobutanol, sec-butanol and tert-butanol.

4 The hydroxide containing double metal cyanide (DMC) catalyst according to Claim 1, wherein the organic ligand, L , is tert-butanol.

30 5. The hydroxide containing double metal cyanide (DMC) catalyst according to Claim 1, wherein M represents Zn^{+2} and M^2 represents Co^{+3} .

6. A process of making a hydroxide containing double metal cyanide (DMC) catalyst of the formulae (I) or (II),



said process comprising the steps of:

reacting a M^1 containing oxide with a M^2 containing

hexacyanometallate or hexacyanometallic acid in the

presence of an organic ligand, L, and water; and

10 collecting the crystalline catalyst,

wherein

M^1 represents a metal selected from the group consisting of Zn^{+2} , Fe^{+2} , Ni^{+2} , Mn^{+2} , Co^{+2} , Sn^{+2} , Pb^{+2} , Fe^{+3} , Mo^{+4} , Mo^{+6} , Al^{+3} , V^{+4} , V^{+5} , Sr^{+2} , W^{+4} , W^{+6} , Cu^{+2} and Cr^{+3} ,

15 M^2 represents a metal selected from the group consisting of Fe^{+2} , Fe^{+3} , Co^{+2} , Co^{+3} , Cr^{+2} , Cr^{+3} , Mn^{+2} , Mn^{+3} , Ir^{+3} , Ni^{+2} , Rh^{+3} , Ru^{+2} , V^{+4} and V^{+5} ,

L represents an organic ligand, and

X, y and q are chosen to maintain electroneutrality.

20

7. The process according to Claim 6, wherein the organic ligand, L, is selected from the group consisting of alcohols, polyols, polyether polyols, aldehydes, ketones, ethers, esters, amides, ureas, nitriles, sulfides and mixtures thereof.

25

8. The process according to Claim 6, wherein the organic ligand, L, is selected from the group consisting of ethanol, isopropanol, n-butanol, isobutanol, sec-butanol and tert-butanol.

30 9. The process according to Claim 6, wherein the organic ligand, L, is tert-butanol.

10. The process according to Claim 6, wherein M^1 represents Zn^{+2} and M^2 represents Co^{+3} .

11. A hydroxide containing double metal cyanide (DMC) catalyst of the
5 formulae (I) or (II),

$$M^1_x[M^2(CN)_6]_yOH \cdot L \quad (I)$$
$$M^1_x[M^2(CN)_6]_y \cdot zM^1(OH)_q \cdot L \quad (II)$$

made by:

reacting a M^1 containing oxide with a M^2 containing
10 hexacyanometallate or hexacyanometallic acid in the presence of an organic complexing ligand, L, and water; and collecting the crystalline catalyst,

wherein

15 M^1 represents a metal selected from the group consisting of Zn^{+2} , Fe^{+2} , Ni^{+2} , Mn^{+2} , Co^{+2} , Sn^{+2} , Pb^{+2} , Fe^{+3} , Mo^{+4} , Mo^{+6} , Al^{+3} , V^{+4} , V^{+5} , Sr^{+2} , W^{+4} , W^{+6} , Cu^{+2} and Cr^{+3} ,

20 M^2 represents a metal selected from the group consisting of Fe^{+2} , Fe^{+3} , Co^{+2} , Co^{+3} , Cr^{+2} , Cr^{+3} , Mn^{+2} , Mn^{+3} , Ir^{+3} , Ni^{+2} , Rh^{+3} , Ru^{+2} , V^{+4} and V^{+5} ,

25 L represents an organic ligand, and

x, y and q are chosen to maintain electroneutrality.

12. A process of making a hydroxide containing double metal cyanide (DMC) catalyst of the formulae (I) or (II),

$$M^1_x[M^2(CN)_6]_yOH \cdot L \quad (I)$$
$$M^1_x[M^2(CN)_6]_y \cdot zM^1(OH)_q \cdot L \quad (II)$$

said process comprising the steps of:

reacting a M^1 containing salt of a strong acid with a M^2 containing
30 hexacyanometallate or hexacyanometallic acid in the presence of an organic ligand, L, and water; and collecting the crystalline catalyst

wherein

M^1 represents a metal selected from the group consisting of Zn^{+2} , Fe^{+2} , Ni^{+2} , Mn^{+2} , Co^{+2} , Sn^{+2} , Pb^{+2} , Fe^{+3} , Mo^{+4} , Mo^{+6} , Al^{+3} , V^{+4} , V^{+5} , Sr^{+2} , W^{+4} , W^{+6} , Cu^{+2} and Cr^{+3} ,

5 M^2 represents a metal selected from the group consisting of Fe^{+2} , Fe^{+3} , Co^{+2} , Co^{+3} , Cr^{+2} , Cr^{+3} , Mn^{+2} , Mn^{+3} , Ir^{+3} , Ni^{+2} , Rh^{+3} , Ru^{+2} , V^{+4} and V^{+5} ,

L represents an organic ligand, and

x, y and q are chosen to maintain electroneutrality.

10

13. The process according to Claim 12, wherein the organic ligand, L, is selected from the group consisting of alcohols, polyols, polyether polyols, aldehydes, ketones, ethers, esters, amides, ureas, nitriles, sulfides and mixtures thereof.

15

14. The process according to Claim 12, wherein the organic ligand, L, is selected from the group consisting of ethanol, isopropanol, n-butanol, isobutanol, sec-butanol and tert-butanol.

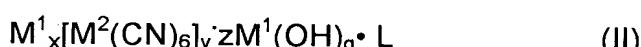
20 15. The process according to Claim 12, wherein the organic ligand, L, is tert-butanol.

16. The process according to Claim 12, wherein M^1 represents Zn^{+2} and M^2 represents Co^{+3} .

25

17. The process according to Claim 12, wherein the strong acid is selected from sulfuric, sulfonic and nitrous acid.

30 18. A hydroxide containing double metal cyanide (DMC) catalyst of the formulae (I) or (II),



made by:

reacting a M¹ containing salt of a strong acid with a M² containing hexacyanometallate or hexacyanometallic acid in the presence of an organic ligand, L, and water; and

5 collecting the crystalline catalyst

wherein

M¹ represents a metal selected from the group consisting of Zn⁺², Fe⁺², Ni⁺², Mn⁺², Co⁺², Sn⁺², Pb⁺², Fe⁺³, Mo⁺⁴, Mo⁺⁶, Al⁺³, V⁺⁴, V⁺⁵, Sr⁺², W⁺⁴, W⁺⁶, Cu⁺² and Cr⁺³,

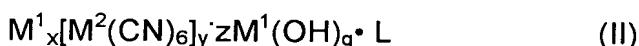
10 M² represents a metal selected from the group consisting of Fe⁺², Fe⁺³, Co⁺², Co⁺³, Cr⁺², Cr⁺³, Mn⁺², Mn⁺³, Ir⁺³, Ni⁺², Rh⁺³, Ru⁺², V⁺⁴ and V⁺⁵,

L represents an organic ligand, and

x, y and q are chosen to maintain electroneutrality.

15

19. A process of making a hydroxide containing double metal cyanide (DMC) catalyst of the formulae (I) or (II),



20 said process comprising the steps of:

reacting a M¹ containing oxide and a M¹ containing salt with a M² containing hexacyanometallate or hexacyanometallic acid in the presence of an organic ligand, L, and water; and
collecting the crystalline catalyst,

25 wherein

M¹ represents a metal selected from the group consisting of Zn⁺², Fe⁺², Ni⁺², Mn⁺², Co⁺², Sn⁺², Pb⁺², Fe⁺³, Mo⁺⁴, Mo⁺⁶, Al⁺³, V⁺⁴, V⁺⁵, Sr⁺², W⁺⁴, W⁺⁶, Cu⁺² and Cr⁺³,

30 M² represents a metal selected from the group consisting of Fe⁺², Fe⁺³, Co⁺², Co⁺³, Cr⁺², Cr⁺³, Mn⁺², Mn⁺³, Ir⁺³, Ni⁺², Rh⁺³, Ru⁺², V⁺⁴ and V⁺⁵,

L represents an organic ligand, and

x, y and q are chosen to maintain electroneutrality.

20. The process according to Claim 19, wherein the organic ligand, L, is selected from the group consisting of alcohols, polyols, polyethers, 5 aldehydes, ketones, ethers, esters, amides, ureas, nitriles, sulfides and mixtures thereof.
21. The process according to Claim 19, wherein the organic ligand, L, is selected from the group consisting of ethanol, isopropanol, n-butanol, 10 isobutanol, sec-butanol and tert-butanol.
22. The process according to Claim 19, wherein the organic ligand, L, is tert-butanol.
- 15 23. The process according to Claim 19, wherein M¹ represents Zn⁺² and M² represents Co⁺³.
24. The process according to Claim 19, wherein the M¹ containing salt contains an anion selected from halides, sulfates, carbonates, cyanides, 20 oxalates, thiocyanates, isocyanates, isothiocyanates, carboxylates and nitrates.
25. A hydroxide containing double metal cyanide (DMC) catalyst of the formulae (I) or (II),
M¹_x[M²(CN)₆]_yOH • L (I)
M¹_x[M²(CN)₆]_y•zM¹(OH)_q • L (II)
made by:
reacting a M¹ containing oxide and a M¹ containing salt with a M² containing hexacyanometallate or hexacyanometallic acid in 30 the presence of an organic ligand, L, and water; and collecting the catalyst,
wherein

M^1 represents a metal selected from the group consisting of Zn^{+2} , Fe^{+2} , Ni^{+2} , Mn^{+2} , Co^{+2} , Sn^{+2} , Pb^{+2} , Fe^{+3} , Mo^{+4} , Mo^{+6} , Al^{+3} , V^{+4} , V^{+5} , Sr^{+2} , W^{+4} , W^{+6} , Cu^{+2} and Cr^{+3} ,

M^2 represents a metal selected from the group consisting of

5 Fe^{+2} , Fe^{+3} , Co^{+2} , Co^{+3} , Cr^{+2} , Cr^{+3} , Mn^{+2} , Mn^{+3} , Ir^{+3} , Ni^{+2} , Rh^{+3} ,
Ru⁺², V⁺⁴ and V⁺⁵,

L represents an organic ligand, and

x, y and q are chosen to maintain electroneutrality.

10 26. In a process for the production of a polyol by polyaddition of an alkylene oxide to a starter compound containing active hydrogen atoms, the improvement comprising conducting the polyaddition in the presence of a crystalline, hydroxide containing double metal cyanide (DMC) catalyst of the formulae (I) or (II).

$$15 \quad M_x^1[M^2(CN)_6]_yOH \cdot L \quad (I)$$

$$M^1_x[M^2(CN)_6]_y \cdot zM^1(OH)_a \cdot L \quad (II)$$

wherein

M^+ represents a metal selected from the group consisting of Zn^{+2} , Fe^{+2} , Ni^{+2} , Mn^{+2} , Co^{+2} , Sn^{+2} , Pb^{+2} , Fe^{+3} , Mo^{+4} , Mo^{+6} , Al^{+3} , V^{+4} , V^{+5} , Sr^{+2} , W^{+4} , W^{+6} , Cu^{+2} and Cr^{+3}

M^2 represents a metal selected from the group consisting of Fe^{+2} , Fe^{+3} , Co^{+2} , Co^{+3} , Cr^{+2} , Cr^{+3} , Mn^{+2} , Mn^{+3} , Ir^{+3} , Ni^{+2} , Rh^{+3} , Ru^{+2} , V^{+4} and V^{+5} .

L represents an organic ligand, and

25 x, y and q are chosen to maintain electroneutrality.

27. The process according to Claim 26, wherein the organic ligand, L, is selected from the group consisting of alcohols, aldehydes, ketones, ethers, esters, amides, ureas, nitriles, sulfides and mixtures thereof.

30

28. The process according to Claim 26, wherein the organic ligand, L, is selected from the group consisting of ethanol, isopropanol, n-butanol, isobutanol, sec-butanol and tert-butanol.

5 29. The process according to Claim 26, wherein M¹ represents Zn⁺² and M² represents Co⁺³.

30. The polyol made according to the process of Claim 26.

10 31. In a process for the production of a polyol, the improvement comprising conducting the polyaddition in the presence of a crystalline, hydroxide containing double metal cyanide (DMC) catalyst of the formulae (I) or (II),

M¹_x[M²(CN)₆]_yOH • L (I)

15 M¹_x[M²(CN)₆]_y•zM¹(OH)_q• L (II)

wherein

M¹ represents a metal selected from the group consisting of Zn⁺², Fe⁺², Ni⁺², Mn⁺², Co⁺², Sn⁺², Pb⁺², Fe⁺³, Mo⁺⁴, Mo⁺⁶, Al⁺³, V⁺⁴, V⁺⁵, Sr⁺², W⁺⁴, W⁺⁶, Cu⁺² and Cr⁺³,

20 M² represents a metal selected from the group consisting of Fe⁺², Fe⁺³, Co⁺², Co⁺³, Cr⁺², Cr⁺³, Mn⁺², Mn⁺³, Ir⁺³, Ni⁺², Rh⁺³, Ru⁺², V⁺⁴ and V⁺⁵,

L represents an organic ligand, and

x, y and q are chosen to maintain electroneutrality.

25

32. A process of making a hydroxide containing double metal cyanide (DMC) catalyst of the formulae (I) or (II),

M¹_x[M²(CN)₆]_yOH • L (I)

M¹_x[M²(CN)₆]_y•zM¹(OH)_q• L (II)

30 said process comprising the steps of:

mixing a M¹ containing salt, a strongly basic compound with a M² containing hexacyanometallate or hexacyanometallic acid in the presence of an organic ligand, L, and water; and collecting the catalyst

5 wherein

M¹ represents a metal selected from the group consisting of Zn⁺², Fe⁺², Ni⁺², Mn⁺², Co⁺², Sn⁺², Pb⁺², Fe⁺³, Mo⁺⁴, Mo⁺⁶, Al⁺³, V⁺⁴, V⁺⁵, Sr⁺², W⁺⁴, W⁺⁶, Cu⁺² and Cr⁺³,

10 M² represents a metal selected from the group consisting of Fe⁺², Fe⁺³, Co⁺², Co⁺³, Cr⁺², Cr⁺³, Mn⁺², Mn⁺³, Ir⁺³, Ni⁺², Rh⁺³, Ru⁺², V⁺⁴ and V⁺⁵,

L represents an organic ligand, and

x, y and q are chosen to maintain electroneutrality.

15 33. The process according to Claim 32, wherein the strongly basic compound is selected from the group consisting of alkali metal hydroxides, alkaline earth metal hydroxides and amines.

20 34. The process according to Claim 32, wherein the organic ligand, L, is selected from the group consisting of alcohols, polyols, polyethers, aldehydes, ketones, ethers, esters, amides, ureas, nitriles, sulfides and mixtures thereof.

25 35. The process according to Claim 32, wherein the organic ligand, L, is selected from the group consisting of ethanol, isopropanol, n-butanol, isobutanol, sec-butanol and tert-butanol.

30 36. The process according to Claim 32, wherein the organic ligand, L, is tert-butanol.

37. The process according to Claim 32, wherein M¹ represents Zn⁺² and M² represents Co⁺³.

38. The process according to Claim 32, wherein the M¹ containing salt contains an anion selected from halides, sulfates, carbonates, cyanides, oxalates, thiocyanates, isocyanates, isothiocyanates, carboxylates and
5 nitrates.